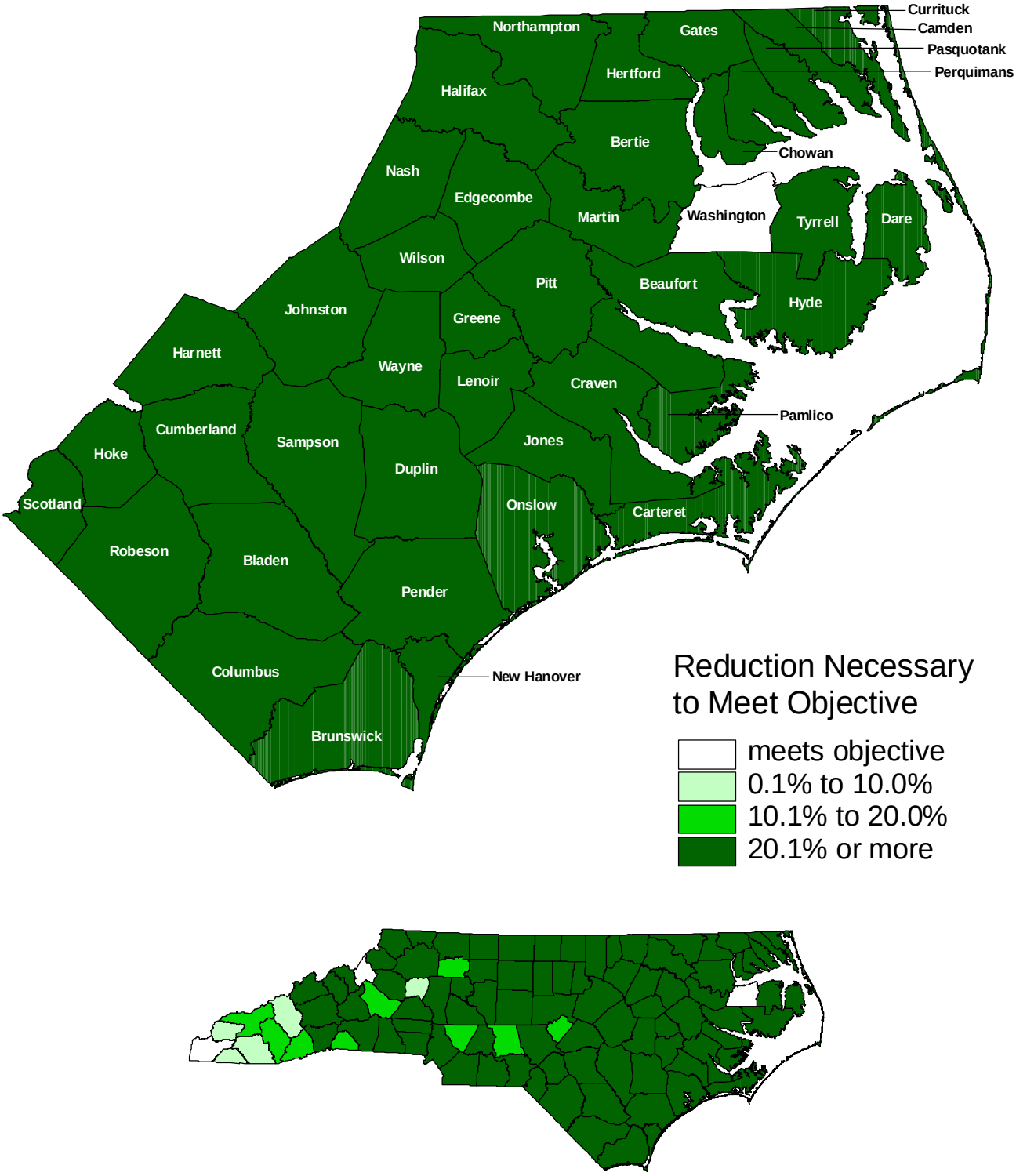
Stroke

Map 8.1 Progress Towards Stroke Mortality Objective



HP 2010 Objective for Stroke Mortality:
Reduce stroke deaths to no more than 48.0 per 100,000 population

Stroke ICD-9 Codes: 430-438
Based on Five-Year Average, Age-Adjusted Rates Standardized to US 2000 SM

Data Source: NC State Center for Health Statistics

STROKE

Stroke, the third leading cause of death in the United States (US), claimed more than 158,000 lives in 1998. An estimated 4.4 million Americans have a history of stroke. Of the approximately 600,000 stokes that occur each year, 500,000 are new cases and 100,000 are recurrent. Of the four million stroke survivors who are alive today, more than two-thirds are living with moderate to severe stroke-related impairments. The total costs of stroke exceeded $51 billion in 2000. Stroke is a major public health problem in North Carolina (NC), accounting for about 8% of all deaths in the state.

Stroke occurs when the brain is deprived of oxygen and nutrients carried by blood. While there are three different types of stroke, atherosclerosis is the primary cause of stroke. Cerebral thrombosis, the most common type of stroke, occurs when blood clots form in arteries of the brain. The second most common type of stroke, cerebral embolism, is caused by blood clots that break off from other areas of the body, travel through the blood stream, and ultimately become lodged in arteries of the brain. These clots may originate in the heart or in the arteries leading from the heart to the brain. Hemorrhage, the least common type of stroke, develops when arteries of the brain rupture. Hemorrhage can cause stroke by either increasing pressure on the brain or depriving the brain of blood. Ruptured aneurysms and head trauma are common causes of brain hemorrhage.

Risk factors for stroke include: advancing age, cigarette smoking, substance abuse, obesity, a sedentary lifestyle, and high cholesterol levels. People with a family history of stroke are at an increased risk, as are those with personal history of hypertension, sickle cell anemia, diabetes, carotid artery disease, heart disease, irregular heart rhythms, or prior stroke. There is also a distinct geographic cluster of high stroke mortality, known as the stroke belt, throughout the southeastern US. Within the stroke belt, high stroke mortality is concentrated in the coastal plains of Georgia, North Carolina, and South Carolina. This area, known as the stroke buckle, has a stroke death rate twice as high as the national rate.

National mortality rates for stroke have been declining since the early 1980's. Although the age-adjusted death rate for stroke declined 14.8% between 1987 and 1997, the *Healthy People 2000* goal has not been attained. In addition, the reduction in stroke mortality was greater for whites than non-whites, and considerable disparities in stroke mortality still exist. Currently, national age-adjusted stroke mortality rates are 7% greater for men than women. The rate for non-white males is 33% higher than the rate for white males, and the rate for non-white females exceeds that of white females by 22%. The *Healthy People 2010* objective for reducing stroke mortality and the goal of eliminating disparities will be difficult to meet in eastern North Carolina (ENC). Forty of the 41 counties in ENC will have to reduce their current mortality rate by more than 20% to meet the objective for 2010 (see Map 8.1). The large differences in the stroke mortality rates of whites and non-whites (42%) and men and women (20%) in ENC also pose a challenge.

HP 2010 OBJECTIVE FOR STROKE MORTALITY

Objective: Reduce stroke deaths to no more than 48.0 per 100,000 population

Baseline: 60.0 stroke deaths per 100,000 population in 1998

Currently, one county in the region meets the objective for stroke mortality.

Crude Mortality Rates for Stroke, 1994-1998:

The five-year average, crude stroke mortality rate for eastern North Carolina (ENC) is 73.4 per 100,000 population, a rate that exceeds the rate (71.5) for all other NC counties (ONC) by about 3% (see Table 8.1). However, the rate for the state as a whole (72.1) is 20% higher than the rate for the US (60.3). The counties in ENC with the highest crude rates are Perquimans (143.0), Bladen (128.4), Jones (128.2), Northampton (128.1), and Sampson (121.2). As Map 8.2 demonstrates, the highest crude rates for stroke are clustered in the northern and central portions of the region.

Age-Adjusted Mortality Rates for Stroke, 1994-1998:

The five-year average, age-adjusted stroke mortality rate for ENC (86.3) is 15% higher than the rate (75.0) for ONC, and it is 37% greater than the national rate (63.2). The highest age-adjusted mortality rates in the region are found in Jones (123.2), Bladen (116.4), Lenoir (115.9), Duplin (115.0) and Sampson (112.6) counties. The stroke mortality rates in each of these counties is at least 1.4 times higher than the NC rate and 1.8 times greater than the US rate. This band of high stroke mortality runs through the center of the region, as shown in Map 8.2.

Trends in Stroke Mortality, 1979-1998:

Stroke mortality has been steadily declining in the eastern region since the early 1980's, following a trend for both the state and the nation (see Figure 8.1). However, the figures depicting trends in stroke mortality also show that mortality rates in ENC have consistently exceeded the rates for ONC and the US. The excess stroke mortality within ENC has been concentrated within the regions minority populations, especially among non-white males. In order to meet the *Healthy People 2010* objective for stoke mortality, 40 of the 41 counties in ENC will have to reduce their current rate by more than 20% to meet the objective for 2010 (see Map 8.1). Only Washington County has a stroke mortality rate that is currently lower than the national objective.

Disparities in Stroke Mortality, 1979-1998:

Figure 8.2 demonstrates considerable disparities in stroke mortality by race and gender. Map 8.3 shows geographic variation in stroke mortality by race and gender. Although stroke mortality for both whites and non-whites has declined in the last three decades, the racial gap in morality has persisted. Mortality disparities between whites and non-whites in ENC increased considerably during the late 1980's. The disparity among females has recently leveled off, while the gap has continued to grow among males. In the rest of the state, racial disparities have been growing among males and females, mainly due to greater declines in mortality for whites as compared to non-whites. These regional and state trends have occurred at a time when national disparities in stroke mortality have declined. Currently, non-white men in ENC die at a rate that exceeds that of their white counterparts by 54%, and non-white females die at a rate that is 34% higher than white females. As Figure 8.1 shows, there are major gender disparities in stroke mortality as well. The stroke mortality rate for males in ENC is currently 20% higher than the rate for females. While there are clear patterns of race and gender disparity for the region as a whole, these patterns do not hold true for all counties in the region. There are seven counties with higher mortality rates for white females than non-white females and three counties with greater mortality among white males than non-white males. Among whites, there are 11 counties with greater rates for females than males, and there are eight such counties among non-whites (see Table 8.1).

Table 8.1 Stroke Mortality in Eastern North Carolina, 1994-1998

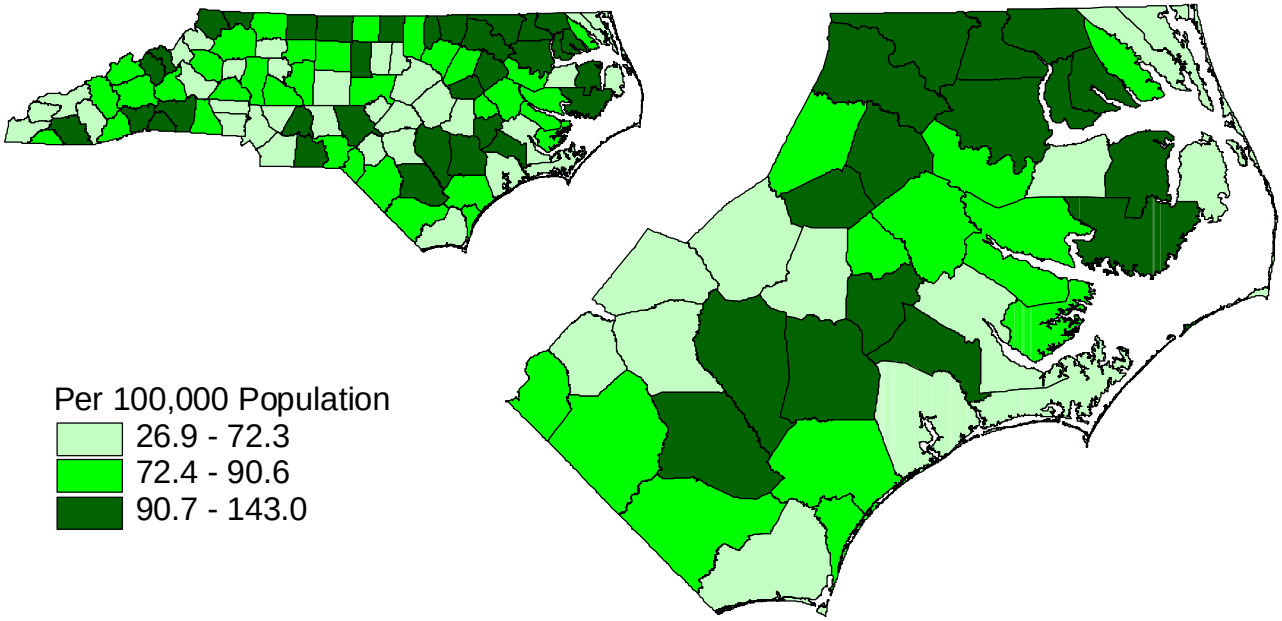
	Totals			Race-Gender Specific Age-Adjusted Death Rates							
		Rates		Non-White Males		Non-White Females		White Males		White Females	
County	Deaths	Crude	Adjusted	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Beaufort	188	86.8	75.6	28	122.8	46	98.7	53	83.4	61	51.1
Bertie	99	97.1	91.0	27	141.9	26	72.9	21	100.8	25	73.9
Bladen	193	128.4	116.4	39	166.8	50	137.6	39	106.4	65	92.2
Brunswick	220	69.9	71.6	17	94.8	18	66.0	78	71.8	107	71.5
Camden	22	69.9	72.5	2	47.7	3	74.3	4	33.6	13	90.1
Carteret	183	62.8	61.1	11	194.1	8	62.5	67	57.9	97	57.3
Chowan	65	92.0	68.3	12	128.6	12	68.6	18	71.9	23	53.9
Columbus	232	89.8	87.1	23	70.5	44	90.3	67	98.8	98	79.8
Craven	288	66.2	79.0	43	130.7	58	101.0	85	80.3	102	61.0
Cumberland	536	36.5	69.6	88	98.4	115	73.1	134	63.3	199	61.5
Currituck	48	59.2	67.2	3	82.2	6	96.3	20	80.8	19	51.2
Dare	69	52.0	65.9	1	77.3	2	85.4	23	60.9	43	71.0
Duplin	261	120.2	115.0	31	124.1	49	113.4	53	86.9	128	122.0
Edgecombe	299	107.1	112.6	73	170.5	90	108.8	58	116.2	78	79.1
Gates	47	95.4	97.9	13	187.8	12	111.7	8	55.5	14	79.1
Greene	71	82.5	84.9	15	145.9	14	76.3	16	107.0	26	68.6
Halifax	284	100.7	94.3	60	133.1	86	107.2	56	93.9	82	69.8
Harnett	246	62.1	71.4	27	105.0	42	108.8	64	59.2	113	61.8
Hertford	116	104.9	92.7	24	108.3	35	91.2	22	97.4	35	78.9
Hoke	69	49.1	67.9	20	100.8	21	68.0	12	57.0	16	49.1
Hyde	27	102.6	82.3	7	156.4	4	62.3	8	85.6	8	61.6
Johnston	359	72.3	80.9	25	92.9	43	94.8	127	94.8	164	68.9
Jones	59	128.2	123.2	13	196.5	13	107.2	11	103.4	22	113.7
Lenoir	354	120.0	115.9	74	208.6	74	103.6	75	117.4	131	99.5
Martin	100	77.7	71.6	21	97.6	26	75.7	23	66.3	30	52.4
Nash	320	74.6	82.0	41	99.8	70	111.3	74	74.0	135	69.0
New Hanover	553	77.4	82.6	53	128.7	72	96.2	178	89.5	250	69.9
Northampton	133	128.1	105.7	39	163.7	40	103.3	23	94.9	31	73.6
Onslow	199	26.9	67.8	17	81.1	26	75.8	63	76.0	93	62.7
Pamlico	49	82.2	64.0	7	119.9	11	105.2	8	36.5	23	59.2
Pasquotank	136	80.0	75.6	19	90.9	22	63.4	41	97.3	54	65.8
Pender	163	90.6	91.6	23	144.0	40	110.8	45	99.1	55	70.2
Perquimans	77	143.0	104.3	15	198.5	16	126.9	15	75.2	31	98.8
Pitt	446	74.3	101.8	91	180.0	111	125.8	100	99.4	144	71.6
Robeson	435	77.8	98.3	106	127.1	129	88.6	77	106.8	123	84.9
Sampson	313	121.2	112.6	50	166.1	80	148.5	60	84.0	123	95.1
Scotland	134	76.8	92.8	28	153.9	34	97.4	28	93.2	44	71.7
Tyrrell	17	91.7	68.0	2	61.9	4	77.7	5	82.0	6	54.7
Washington	35	51.9	47.1	5	51.1	7	46.1	8	45.2	15	47.3
Wayne	392	70.1	89.2	66	129.0	80	88.2	112	105.9	134	71.5
Wilson	341	99.8	104.9	56	154.3	73	107.7	75	87.4	137	95.2
ENC 29	4,725	78.4	88.0	816	137.9	1,024	98.2	1,145	84.4	1,740	72.3
ENC 41	8,178	73.4	86.3	1,315	129.5	1,712	96.6	2,054	83.8	3,097	72.1
ONC	18,177	71.5	75.0	1,406	113.8	1,972	93.0	5,499	73.3	9,300	67.8
PNC	13,408	68.5	77.7	1,251	114.3	1,742	92.3	3,810	75.9	6,605	69.8
WNC	4,769	81.6	68.3	155	111.4	230	99.5	1,689	68.6	2,695	63.5
NC	26,355	72.1	78.3	2,721	121.0	3,684	94.6	7,553	75.9	12,397	68.9
US, 1996	159,942	60.3	63.2	9,459	83.3	12,187	72.0	53,016	62.7	85,280	59.0

Stroke ICD-9 Codes: 430-438
Age-Adjusted Rates Standardized to US 2000 SM
Total Number of Deaths and Rates for Five-Year Period, except US

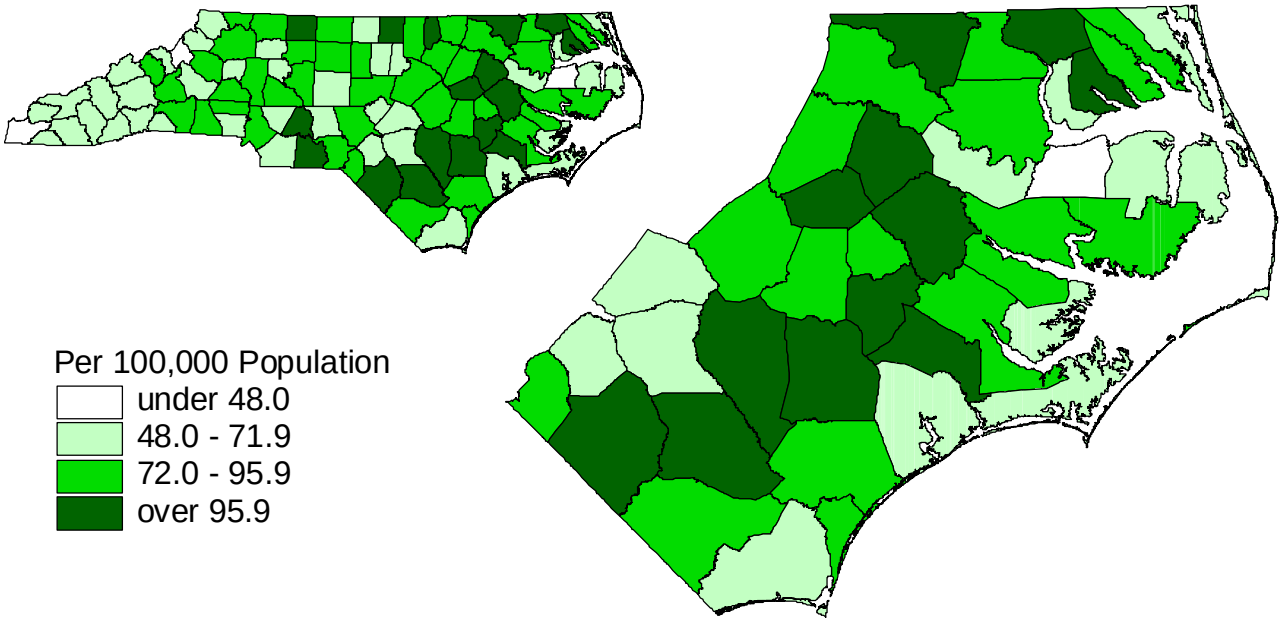
NC Data Source: NC State Center for Health Statistics
US Data Source: National Center for Health Statistics

Map 8.2 Crude and Age-Adjusted Stroke Mortality Rates: North Carolina and Eastern North Carolina, 1994-1998

Crude Rate



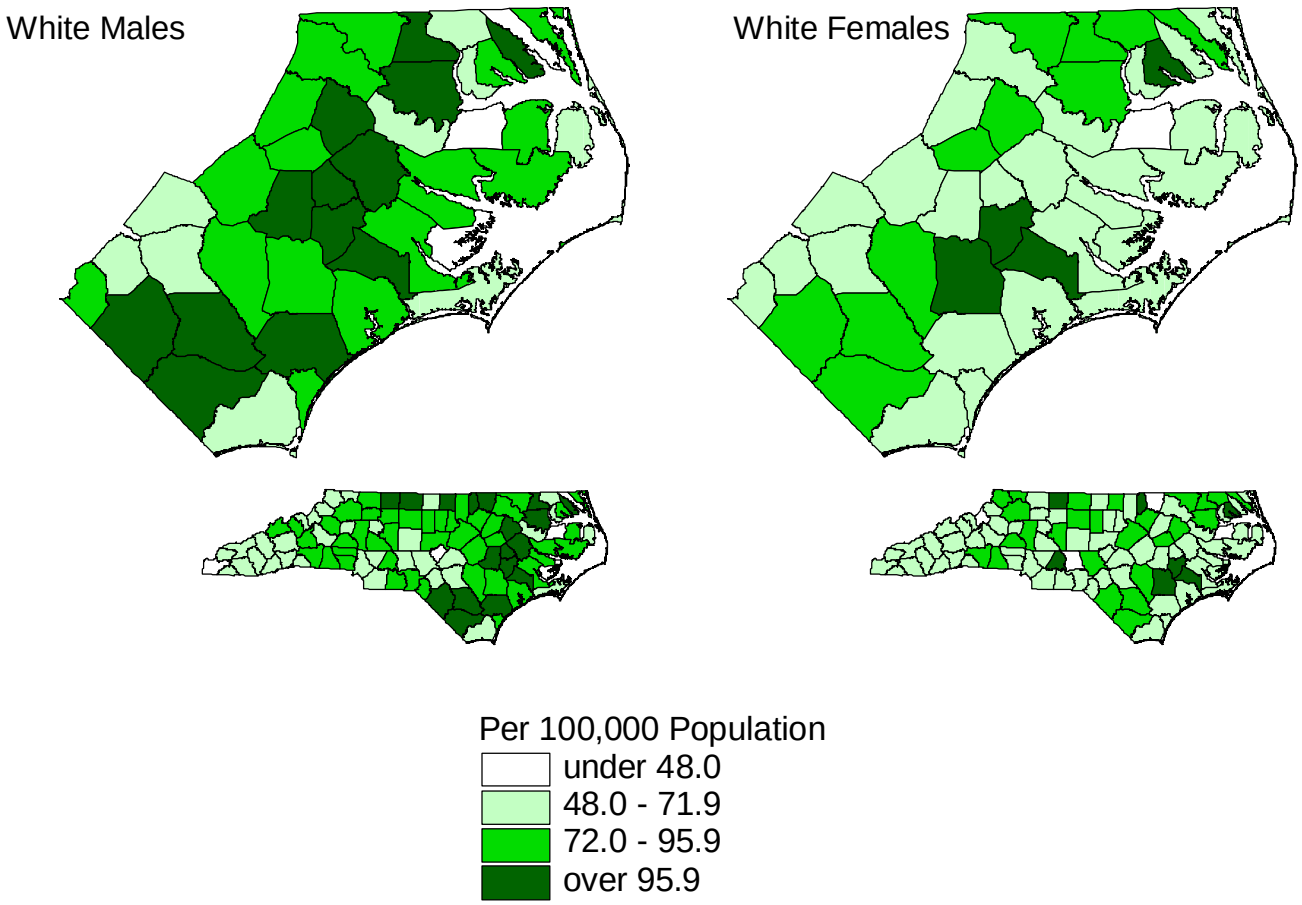
Age-Adjusted Rate



Stroke ICD-9 Codes: 430-438
Five-Year Average, Age-Adjusted Rates Standardized to US 2000 SM

NC Data Source: NC State Center for Health Statistics

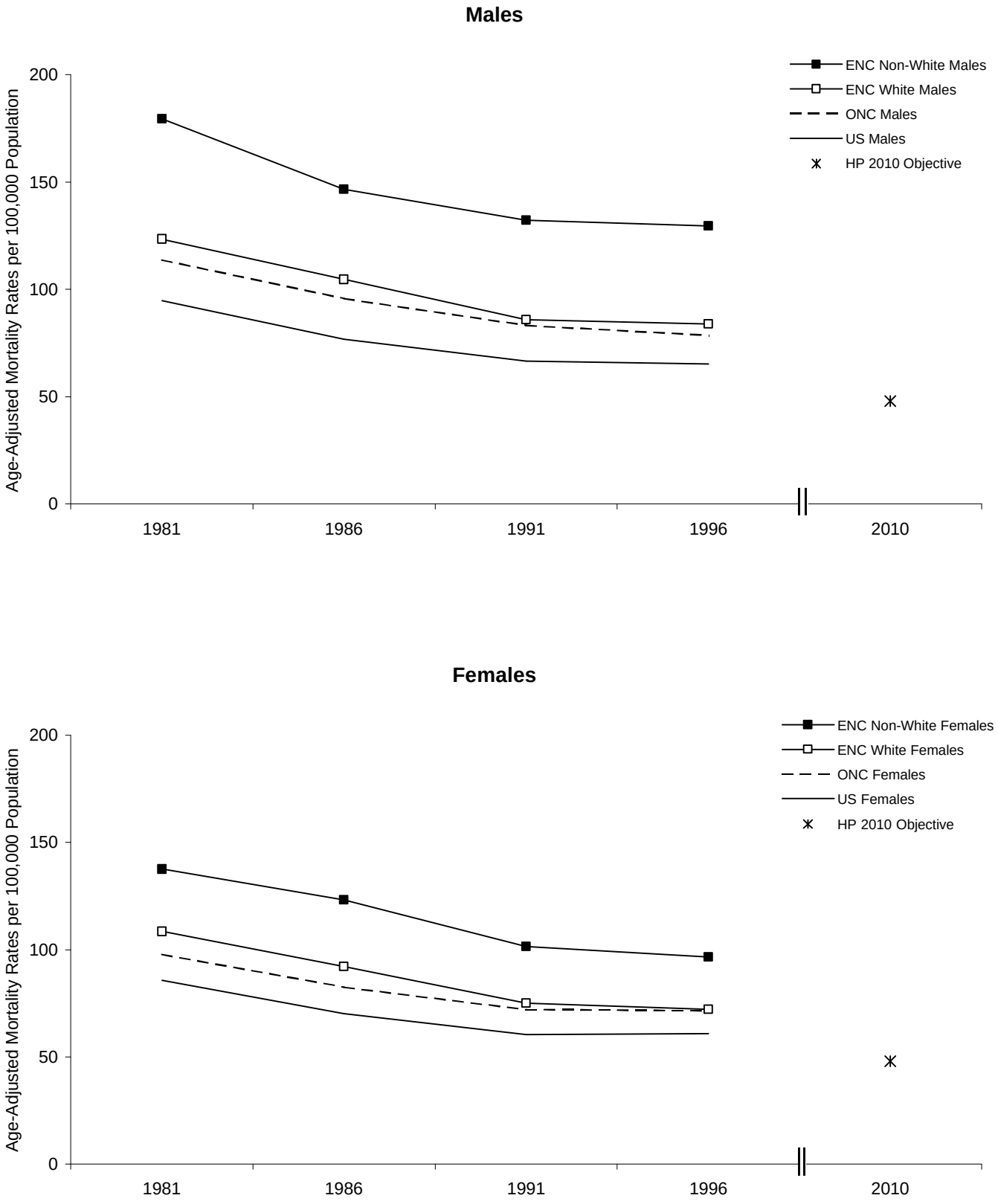
Map 8.3 Race-Gender Specific, Age-Adjusted Stroke Mortality Rates: North Carolina and Eastern North Carolina, 1994-1998



Stroke ICD-9 Codes: 430-438
Five-Year Average, Age-Adjusted Rates Standardized to US 2000 SM

NC Data Source: NC State Center for Health Statistics

Figure 8.1 Age-Adjusted Stroke Mortality Rates by Gender: Regional and National Trends, 1979-1998



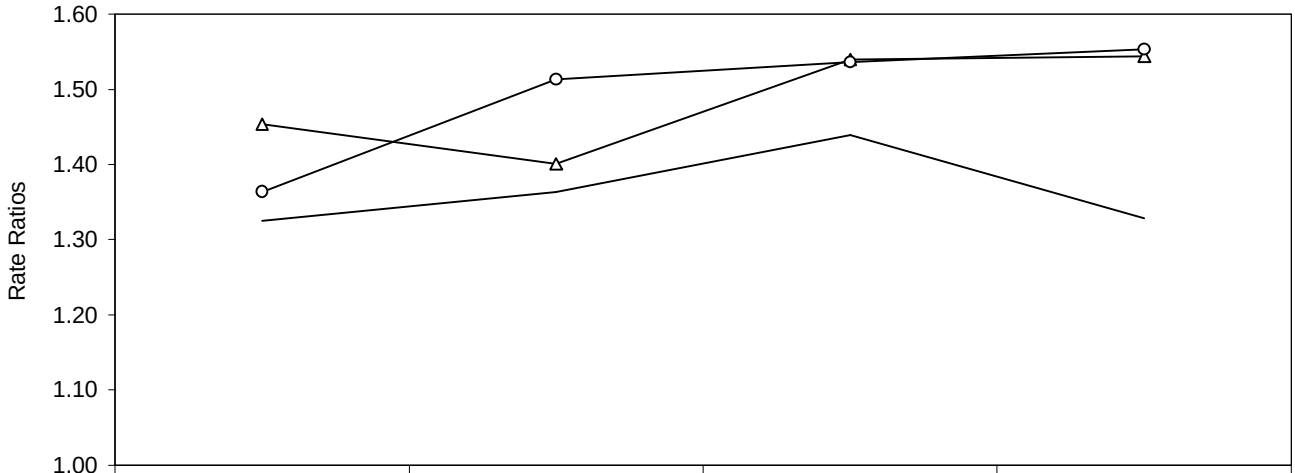
Stroke ICD-9 Codes: 430-438
Five-Year Average, Age-Adjusted Rates Standardized to US 2000 SM
US Rates for Middle Year of Five Year Periods

NC Data Source: NC State Center for Health Statistics
US Data Source: National Center for Health Statistics

Figure 8.2 Racial Disparities in Age-Adjusted Stroke Mortality Rates by Gender: Regional and National Trends, 1979-1998

Males

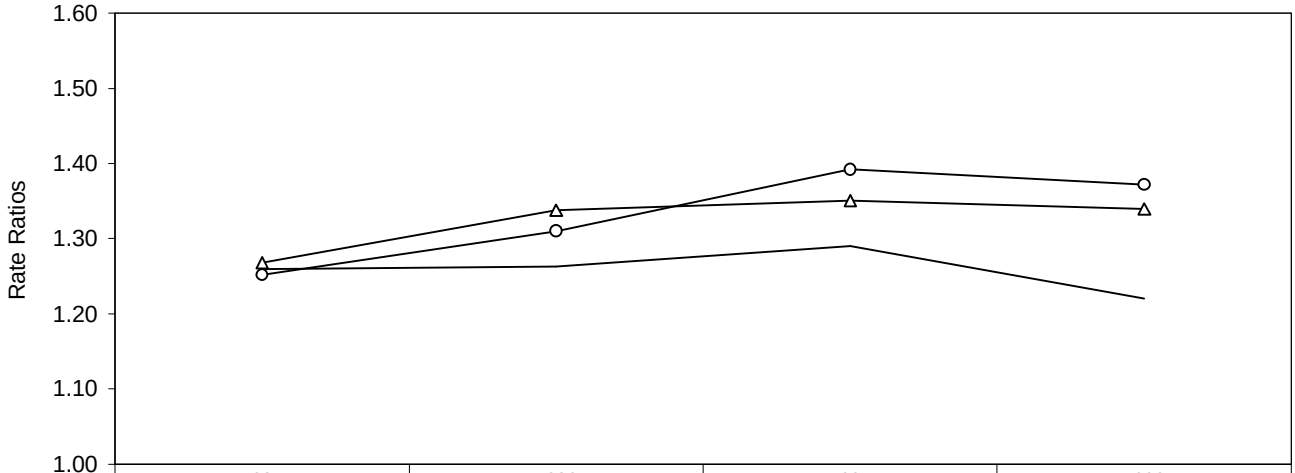
Non-White to White Rate Ratios



	1981	1986	1991	1996
ENC	1.45	1.40	1.54	1.54
ONC	1.36	1.51	1.54	1.55
US	1.32	1.36	1.44	1.33

Females

Non-White to White Rate Ratios



	1981	1986	1991	1996
ENC	1.27	1.34	1.35	1.34
ONC	1.25	1.31	1.39	1.37
US	1.26	1.26	1.29	1.22

Stroke ICD-9 Codes: 430-438
Based on Five-Year Average, Age-Adjusted Rates Standardized to US 2000 SM
US Rates for Middle Year of Five Year Periods

NC Data Source: NC State Center for Health Statistics
US Data Source: National Center for Health Statistics

SOURCES OF INFORMATION ABOUT STROKE

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American Heart Association
(http://www.americanheart.org)

American Heart, Lung, and Blood Institute
(http://www.nhlbi.nih.gov)

Centers for Disease Control and Prevention
(http://www.cdc.gov)

Healthy People 2010
(http://web.health.gov/healthypeople)

National Center for Health Statistics
(http://www.cdc.gov/nchs)

North Carolina Center for Health Statistics
(http://www.schs.state.nc.us/SCHS)

North Carolina Heart Disease and Stroke Prevention Task Force
(http://startwithyourheart.com)

Appendix H

ICD-9 Codes for Stroke

430: Subarachnoid hemorrhage
431: Intracerebral hemorrhage
432: Other and unspecified intracranial hemorrhage
433: Occlusion and stenosis of precerebral arteries
434: Occlusion of cerebral arteries
435: Transient cerebral ischemia
436: Acute, but ill-defined, cerebrovascular disease
437: Other and ill-defined cerebrovascular disease
438: Late effects of cerebrovascular disease